

(12) UK Patent Application (18) GB (11) 2 179 664 (13) A

(43) Application published 11 Mar 1987

(21) Application No 8519781

(22) Date of filing 7 Aug 1985

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(51) INT CL⁴

C08K 3/08 A01K 95/00 C08L 53/00

(52) Domestic classification (Edition I)

C3K 101 MA
A1A 15
C3W 217A 219 302A 310A 324A
U1S 1022 3001 3081 A1A C3K

(56) Documents cited

GB A 2156357 GB 1455513
GB A 2150935 GB 1436311

(58) Field of search

C3K
C3P
C3V

(54) Polymer compositions containing particulate metal filler

(57) A flexible metallic rod or bar comprises high loadings of a particulate metal or metals bound together using an ethylene, vinyl acetate copolymer. The binder system may be substituted in part by compatible elastomers, extenders, tackifiers or other polymers. The preferred metallic powders used are copper or tungsten or a mixture of both. These components may be intimately mixed by either "dry" compounding techniques at relatively high temperatures or by using suitable solvents such as *iii* Trichloroethane. After extrusion into its appropriate cross sectional form, the flexible composite is then slit to facilitate the attachment of a fishing line or similar. The slit in this bar is preferably in a spiral configuration and at any angle but the most successful employed is 60° from the axis of the bar.

SPECIFICATION

Non-toxic, lead free, fishing weights & a process for their manufacture

- 5 This invention relates to the manufacture of a non toxic substitute for lead fishing weights and method for its attachment to a line. It has been found that a metal powder or mixture of metal powders can be loaded to a very high percentage by weight (e.g. up to 97.5%) with an elastomeric binder. Block copolymers of ethyl vinyl acetate with vinyl acetate content up to 45% and also copolymers of polyether block amide are used as the major component of the plastic binder. These may be used alone or in conjunction with chemically and physically compatible plasticisers, extenders and tackifiers or other polymers. Using a distribution of powder sizes increases the density of the final product so that densities in the range 2 - 16g per c.c. can be achieved but more typically 4 - 10g per c.c. Surface coating agents may be employed e.g. silanes or titanates in concentration up to 2% by weight of the metal powder in order to aid the compounding properties.
- 10 After suitable mixing and extrusion a flexible bar or cylinder of any geometrical cross section preferably round and solid is formed that may be easily cut or scored. Thus the present invention may be used by anglers as a substitute for split lead shot in which this rod or "worm" may be cut to various lengths corresponding to the weights commonly used.
- 15 A split in this rod or "worm" is made during or following manufacture so as to secure the weight to the fishing line. The split may be axial or spiral and to any depth from 20 - 80% of the rod diameter, preferably 60% in the case of the axial slit and preferably 40% in the case of the spiral slit. Any angle from the axis of the rod may be used but 45° - 60° is the more preferred range. In either the case of the axial slit or the spiral slit the cut may be made perpendicular to the tangent of the cross section of the rod or some angle from it in order to more effectively secure the weight to the fishing line.
- 20 The following mix is given as an example only and should not be regarded as restricting the scope of this invention.

PARTS BY WEIGHT

FILLER CONSTITUENTS		
1)	Spherical copper powder (150 mesh)	40.0
30 2)	Spherical copper powder (80 mesh to dust)	20.0
3)	Spherical copper powder (500 mesh)	1.0
4)	Tungsten powder (500 mesh)	34.0
BINDER CONSTITUENTS		
35 5)	EVA COPOLYMER	5.0
6)	Liquid paraffin (extender/tackifier)	0.2
1) & 2)	from Wolstenhorne Bronze.	
3)	from Eckert U.K.	
40 4)	from Murex	
5)	Levapren 450 P from Bayer	
6)	from B.D.H.	

- The elastomer and tackifier may first be dissolved in a suitable solvent e.g. 1,1,1. trichloroethane and the mixture of metals is blended into this lacquer. The solvent is then evaporated off using a heated bath. The mixture can then be further blended using a heated two or three roll mill. After cooling, the compounded material is granulated to provide a feedstock of a regular dimension suitable for an extruder. The material can be extruded using an appropriately dimensioned adaptor plate and, more normally, a general purpose screw. The flexible rod so produced can then be cooled through a water bath or air and coiled on a spool. The density achieved in this example was 7.3g per c.c. after extrusion. The mixers, granulators and extruders mentioned in the foregoing are all well known to those versed in the production of plastic materials.

The slit is cut into the rod by feeding through a rotating knife whereby the knife is set perpendicularly to the direction of feed and its speed of rotation is taken from the rate of feed of the rod into the machine. The depth of cut can be set by adjusters on the knife as can the angle of cut into the rod.

CLAIMS

1. An elastomer bound thermoplastic, particulate metal composition in which the binder consists of a block copolymer of low density polyethylene together with vinyl acetate, the latter component comprising from 40% by weight to 50% by weight of the block copolymer.
2. A composition as described in claim (1) in which the binder content comprises from 2.5% to 25% by weight of the total composition.
3. A composition as described in claims (1) and (2) in which a liquid polyisobutylene of a molecular weight up to 5000 may be added in an amount of up to 10% by weight of the binder system.
- 65 4. A composition as described in claims (1) to (3) in which the particulate metal component is copper

powder of a particle size not exceeding 200 μm in maximum dimension.

5. A composition according to claims (1) to (4) in which all or part of the particulate metal consists of tungsten powder of from 200 μm down to sub micron particle size.

6. An extruded and flexible, rod or bar of composition as described in claims (1) to (5) in which the cut is 5 spiral or axial and at any angle to the centre of the said rod or bar.

7. An extruded flexible rod or bar as described in claims (6) in which the depth of cut does not exceed 60% of the diameter of the said rod or bar.

8. A flexible rod or bar as described in claims (1) to (7) which is attached to a fishing line by any of the methods so described.

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